CLAIMS

1. A method for making an optical assembly, comprising the steps of:

providing a first submount having a standoff structure protruding from a first surface thereof;

pressing an optical emitter chip against the standoff structure such that at least said emitter chip deforms and said emitter chip contacts said standoff structure in a first plurality of contact portions of said standoff structure, said emitter chip having at least a first emitter;

bonding said emitter chip to said first submount;

juxtaposing an integrated optics chip against said standoff structure such that a first optical receiver of said integrated optics chip can receive optical energy emitted by said first emitter; and

bonding said integrated optics chip to said first submount.

2. A method according to claim 1, wherein said first emitter is disposed on a subject edge of said emitter chip,

and wherein said standoff structure comprises a plurality of at least three segments which are mutually isolated from each other at least under said subject edge of said emitter chip, and which are arranged such that each segment includes a respective first portion which contacts said emitter chip and a respective second portion which contacts said integrated optics chip.

3. A method according to claim 1, wherein said step of bonding said emitter chip to said first submount comprises the steps of:

applying an epoxy between two of said contact portions on said first submount; and

after said step of pressing, curing said epoxy.

4. A method according to claim 1, wherein said step of bonding said emitter chip to said first submount comprises the steps of:

flowing solder between two of said contact portions on said first submount; and

after said step of pressing, cooling said solder.

5. A method according to claim 1, further comprising the step of forming solder bumps between said contact portions on said first submount,

wherein said step of bonding said emitter chip to said first submount is performed as part of said step of pressing said emitter chip against said standoff structure.

6. A method according to claim 1, wherein said step of bonding said emitter chip to said first submount comprises the step of applying an electrically conductive bonding material to an electrical trace disposed on said first submount between said contact portions, said bonding material being in electrical contact with an electrical connection pad on said emitter chip after said step of bonding said emitter chip to said first submount.

7. A method according to claim 1, wherein said step of bonding said integrated optics chip to said first submount comprises the step of applying an electrically conductive bonding material to an electrical trace disposed on said first submount between said contact portions, said bonding material being in electrical contact with an electrical connection pad on said integrated optics chip after said step of bonding said integrated optics chip to said first submount.

8. A method according to claim 1, wherein said first plurality of contact portions includes all points on said standoff structure which contact said emitter chip after said step of pressing,

wherein said emitter chip includes a plurality of optical emitters arranged along a first edge of said emitter chip,

and wherein at least three consecutive ones of said contact portions along said first edge of said emitter chip are mutually isolated from each other along said first edge.

9. A method according to claim 1, wherein said emitter chip is an optical emitter array chip having a plurality of optical emitters including said first emitter.

10. A method according to claim 1, further comprising the step of pressing said integrated optics chip against said standoff structure after said step of juxtaposing, such that at least said integrated optics chip deforms and said integrated optics chip contacts said standoff structure in a second plurality of contact portions of said standoff structure.

11. A method according to claim 10, wherein said integrated optics chip comprises a plurality of optical ports, and wherein said step of attaching further comprises the steps of:

activating said first optical emitter to emit optical energy and monitoring optical energy captured by said integrated optics chip; and

repositioning said integrated optics chip laterally relative to said first submount in response to said step of monitoring.

12. A method according to claim 11, wherein said step of repositioning includes the step of repositioning said integrated optics chip longitudinally relative to said first submount in response to said step of monitoring.

13. A method according to claim 11, wherein said steps of monitoring and repositioning are performed prior to said steps of pressing said integrated optics chip against said standoff structure and bonding said integrated optics chip to said first submount.

14. A method according to claim 10, wherein said emitter chip has a plurality of emitters including located on a first edge of said emitter chip,

and wherein said integrated optics chip has a second plurality of optical receivers located on a second edge of said integrated optics chip,

further comprising the step of forming additional material on at least a portion of a first major surface of said emitter chip prior to said step of pressing an optical emitter chip against said standoff structure, such that the optical emitters in said plurality of emitters are located on said first edge at the same distance away from said first major surface as the optical receivers are located away from a major surface of said integrated optics chip.

15. A method according to claim 10, wherein said emitter chip has a plurality of emitters including located on a first edge of said emitter chip,

and wherein said integrated optics chip has a second plurality of optical receivers located on a second edge of said integrated optics chip,

further comprising the step of forming additional material on at least a portion of a first major surface of said integrated optics chip prior to said step of juxtaposing an integrated optics chip against said standoff structure, such that the

optical emitters in said plurality of emitters are located on said first edge at the same distance away from said first major surface as the optical receivers are located away from a major surface of said integrated optics chip.

16. A method according to claim 1, wherein said emitter chip includes first and second opposite major surfaces, and wherein said step of pressing comprises the steps of:

affixing said first surface of said emitter chip to a compliant surface of a chuck;

moving said chuck such that said second surface of said optical component contacts said standoff structure; and

pressing said chuck toward said first submount until said emitter chip deforms to contact said standoff structure in said first plurality of contact portions.

17. A method according to claim 1, further comprising the step of providing a first optical fiber disposed such that a receiving end of said first optical fiber can receive optical energy output from a first optical output of said integrated optics chip.

18. A method according to claim 17, further comprising the step of connecting an output end of said first optical fiber to provide pump optical energy to an optical amplifier.

19. A method according to claim 1, wherein said integrated optics chip comprises a mode converter in an optical path from said first optical receiver to a first optical output of said integrated optics chip.

20. A method according to claim 19, wherein said mode converter comprises a waveguide taper.

21. A method according to claim 1, wherein said integrated optics chip comprises:

a first waveguide segment in a first optical path from said first optical receiver to a first optical output of said integrated optics chip; and

a first wavelength stabilizer disposed in said first waveguide segment.

22. A method according to claim 21, wherein said wavelength stabilizer comprises a first feedback grating superimposed on said first waveguide segment.

23. A method according to claim 1, wherein said emitter chip further has a second optical emitter,

wherein said step of juxtaposing includes the step of juxtaposing said integrated optics chip against said standoff structure such that a second optical receiver of said integrated optics chip can receive optical energy emitted by said second emitter,

and wherein said integrated optics chip further comprises a directional coupler having a first input in a first optical path downstream of said first optical receiver, a second input in a second optical path downstream of said second optical receiver, and an output in an optical path upstream of said first optical output.

24. A method according to claim 1, wherein said integrated optics chip comprises a polarization rotator disposed in a first optical path from said first optical receiver to a first optical output of said integrated optics chip.

25. A method according to claim 1, wherein said integrated optics chip comprises a power monitor disposed to monitor optical power received by said first optical receiver.

26. A method according to claim 1, wherein said integrated optics chip comprises a controllable optical switch.

27. A method according to claim 1, wherein said integrated optics chip has a plurality of optical outputs, further comprising the step of attaching an optical fiber array having a plurality of optical fibers, such that receiving ends of each of said fibers can receive optical energy output from a respective one of the optical outputs of said integrated optics chip.

28. A method according to claim 27, wherein said step of attaching an optical fiber array comprises the step of attaching said optical fiber array to said first submount.

29. A method according to claim 28, further comprising the step of forming a plurality of longitudinally-oriented v-grooves in said first submount downstream of said integrated optics chip,

and wherein said step of attaching said optical fiber array to said first submount comprises the step of affixing each of said fibers in a respective one of said v-grooves.

30. A method according to claim 29, wherein said step of affixing occurs after said steps of bonding said emitter chip to said first submount and bonding said integrated optics chip to said first submount.

31. A method according to claim 28, wherein said first submount includes longitudinally-oriented recesses, and wherein said step of attaching said optical fiber array to said first submount comprises the steps of:

attaching each of said fibers in a longitudinally-oriented v-groove in the undersurface of a fiber holder; and

attaching said fiber holder to said first submount, said fibers depending below the undersurface of said fiber holder and into said recesses in said first submount.

32. A method according to claim 27, wherein said step of attaching an optical fiber array comprises the steps of:

providing a second submount having a second standoff structure protruding from a first surface thereof;

juxtaposing an overhang portion of said integrated optics chip overhanging said first submount against said second standoff structure such that said integrated optics chip contacts said second standoff structure in a third plurality of contact portions of said second standoff structure;

bonding said overhang portion of said integrated optics chip to said second submount; and

attaching said optical fiber array to said second submount.

33. A method according to claim 32, wherein said second submount is spaced longitudinally from said first submount.

34. A method according to claim 32, wherein said second submount includes longitudinal recesses, and wherein said step of attaching said optical fiber array to said second submount comprises the steps of:

attaching each of said fibers in a longitudinally-oriented v-groove in the undersurface of a fiber holder; and

attaching said fiber holder to said second submount, said fibers depending below the undersurface of said fiber holder and into said recesses in said second submount.

35. A method according to claim 27, further comprising the step of connecting an output end of one of said optical fibers to provide pump optical energy to an optical amplifier.

36. A method according to claim 27, further comprising the step of connecting the output end of each of said optical fibers to provide pump optical energy to a respective optical amplifier.

37. A method according to claim 1, wherein said integrated optics chip has first and second optical outputs, both having a common plane of optical polarization, further comprising the steps of:

providing a polarization coupler having first and second polarization maintaining input fibers and an output fiber;

attaching said first input fiber so as to receive optical energy from said first optical output, said first input fiber being attached with a first rotation relative to said output fiber; and

attaching said second input fiber so as to receive optical energy from said second optical output, said second input fiber being attached with a second rotation 90° different from said first input fiber.

38. A product produced using the method of any of claims 1, 9, 10, 27 and 35.

39. Optical apparatus comprising:

a first submount having a standoff structure protruding from a first surface thereof;

an optical emitter chip bonded to said first submount, said optical emitter chip having a first optical emitter and contacting said standoff structure in a first plurality of contact portions of said standoff structure, said first plurality of contact portions including all points on said standoff structure which contact said emitter chip, at least three consecutive ones of said contact portions along a straight line being mutually isolated from each other along said straight line; and

an integrated optics chip having a first optical receiver, said integrated optics chip being bonded to said first submount in such a way that said first optical receiver can receive optical energy emitted by said first emitter.

40. Apparatus according to claim 39, wherein said integrated optics chip contacts said standoff structure in a second plurality of contact portions of said standoff structure, said second plurality of contact portions including all points on said standoff structure which contact said integrated optics chip, at least three consecutive ones of said contact portions in said second plurality of contact portions along a given straight line being mutually isolated from each other along said given straight line.

41. Apparatus according to claim 39, further comprising an epoxy bonding said emitter chip to said first submount, said epoxy being located between two of said contact portions on said first submount and not on any of said contact portions.

42. Apparatus according to claim 39, further comprising solder bonding said emitter chip to said first submount, said solder being located between two of said contact portions on said first submount and not on any of said contact portions.

43. Apparatus according to claim 39, further comprising:

an electrical trace disposed on said first submount between said contact portions;

and an electrical connection pad on said emitter chip; and

an electrically conductive material bonding said emitter chip to said first submount and making electrical contact with both said electrical trace on said first submount and said electrical connection pad on said emitter chip.

44. Apparatus according to claim 39, further comprising:

an electrical trace disposed on said first submount between said contact portions;

and an electrical connection pad on said integrated optics chip; and

an electrically conductive material bonding said integrated optics chip to said first submount and making electrical contact with both said electrical trace on said first submount and said electrical connection pad on said integrated optics chip.

45. Apparatus according to claim 44, wherein said electrically conductive material is a solder.

46. Apparatus according to claim 39, wherein said emitter chip includes a plurality of optical emitters arranged along a first edge of said emitter chip,

and wherein at least three consecutive ones of said contact portions along a straight line parallel to said first edge of said emitter chip are mutually isolated from each other along said straight line parallel to said first edge.

47. Apparatus according to claim 39, wherein said standoff structure comprises a plurality of ribs arranged such that each rib includes a respective first segment which is in said first plurality of contact portions and a respective second segment which extends under said integrated optics chip.

48. Apparatus according to claim 39, wherein said integrated optics chip includes a first optical output,

further comprising a first optical fiber having a receiving end disposed such that it can receive optical energy output from said first optical output of said integrated optics chip.

49. Apparatus according to claim 48, further comprising an optical amplifier having an optical pump input connected to receive optical energy from said first optical fiber.

50. Apparatus according to claim 48, wherein said integrated optics chip comprises a mode converter in an optical path from said first optical receiver to said first optical output.

51. Apparatus according to claim 48, wherein said integrated optics chip comprises:

an input waveguide segment receiving optical energy from said first optical receiver and supporting an input optical mode;

an output waveguide segment downstream of said input waveguide segment and providing optical energy to said first optical output and supporting an output optical mode; and

a mode converter disposed in an optical path from said input optical waveguide segment to said output waveguide segment and converting said input optical mode to said output optical mode.

52. Apparatus according to claim 51, wherein said input optical mode optimizes acceptance of optical energy from said first emitter into said input waveguide segment.

53. Apparatus according to claim 51, wherein said output optical mode optimizes delivery of optical energy from said first output of said integrated optics chip into said first optical fiber.

54. Apparatus according to claim 51, wherein said input optical mode optimizes acceptance of optical energy from said first emitter into said input waveguide segment, and wherein said output optical mode matches an optical mode supported by said first optical fiber.

55. Apparatus according to claim 51, wherein said mode converter comprises a waveguide taper.

56. Apparatus according to claim 39, wherein said integrated optics chip comprises:

a first waveguide segment in a first optical path from said first optical receiver to a first optical output of said integrated optics chip;

a first feedback grating superimposed on said first waveguide segment; and

a first optical monitor disposed to receive optical energy scattered out of said waveguide by said feedback grating.

57. Apparatus according to claim 39, wherein said integrated optics chip comprises:

a first waveguide segment in a first optical path from said first optical receiver to a first optical output; and

a first wavelength stabilizer disposed in said first waveguide segment.

58. Apparatus according to claim 57, wherein said wavelength stabilizer comprises a first feedback grating superimposed on said first waveguide segment.

59. Apparatus according to claim 57, wherein said integrated optics chip further comprises a first waveguide taper in said first path upstream of said first waveguide segment.

60. Apparatus according to claim 57, wherein said integrated optics chip further comprises a second waveguide taper in said first path downstream of said first waveguide segment.

61. Apparatus according to claim 57, wherein said emitter chip further has a second optical emitter and said integrated optics chip has a second optical receiver, said integrated optics chip being disposed further so that said second optical receiver can receive optical energy emitted by said second emitter,

and wherein said integrated optics chip further comprises a second wavelength stabilizer in a second waveguide segment in a second optical path downstream of said second optical receiver.

62. Apparatus according to claim 61, wherein said first and second wavelength stabilizers are tuned to different wavelengths,

and wherein said integrated optics chip further comprises a directional coupler in said first path downstream of said first stabilizer and coupling optical energy from said second path downstream of said second stabilizer into said first path toward said first optical output.

63. Apparatus according to claim 61, wherein said first and second wavelength stabilizers are tuned to different wavelengths,

wherein said second optical path in said integrated optics chip terminates with a second optical output of said integrated optics chip,

further comprising a fused fiber coupler having first and second receiving optical fibers, said first receiving fiber being disposed such that it can receive optical energy output from said first optical output of said integrated optics chip, and said second receiving fiber being disposed such that it can receive optical energy output from said second optical output of said integrated optics chip.

64. Apparatus according to claim 39, wherein said emitter chip further has a second optical emitter and said integrated optics chip has a second optical

receiver, said integrated optics chip being disposed further so that said second optical receiver can receive optical energy emitted by said second emitter,

and wherein said integrated optics chip further comprises a directional coupler having a first input in a first optical path downstream of said first optical receiver, a second input in a second optical path downstream of said second optical receiver, and an output in an optical path upstream of said first optical output.

65. Apparatus according to claim 39, wherein said integrated optics chip comprises a polarization rotator disposed in a first optical path from said first optical receiver to a first optical output of said integrated optics chip.

66. Apparatus according to claim 65, wherein said emitter chip further has a second optical emitter and said integrated optics chip has a second optical receiver, said integrated optics chip being disposed further so that said second optical receiver can receive optical energy emitted by said second emitter,

and wherein said integrated optics chip further comprises a directional coupler in said first path downstream of said polarization rotator and coupling optical energy into said first path toward said first optical output from said second optical receiver.

67. Apparatus according to claim 39, wherein said integrated optics chip comprises a power monitor disposed to monitor optical power received by said first optical receiver.

68. Apparatus according to claim 39, wherein said integrated optics chip comprises a controllable optical switch.

69. Apparatus according to claim 39, wherein said emitter chip further has a second and third optical emitters and said integrated optics chip has second and third optical receivers, said integrated optics chip being disposed further such that said second optical receiver of said integrated optics chip can receive optical energy emitted by said second emitter and such that said third optical receiver of said integrated optics chip can receive optical energy emitted by said third emitter,

and wherein said integrated optics chip further comprises:

a first waveguide in a first path from said first optical receiver to a first optical output of said integrated optical chip;

a second waveguide in a second path from said second optical receiver to a second optical output of said integrated optical chip; and

a cross-connect switching structure which switches optical energy from said third optical receiver selectably into (a) said first path toward said first optical output, (b) or said second path toward said second optical output, or (c) neither.

70. Apparatus according to claim 39, wherein said integrated optics chip has a plurality of optical outputs, further comprising an optical fiber array having a plurality of optical fibers, each of said fibers having a respective receiving end disposed to receive optical energy output from a respective one of the optical outputs of said integrated optics chip.

71. Apparatus according to claim 70, wherein said optical fiber array is attached to said first submount.

72. Apparatus according to claim 71, wherein each of said optical fibers is affixed in a respective longitudinally-oriented v-groove in said first submount downstream of said integrated optics chip.

73. Apparatus according to claim 71, wherein said first submount includes longitudinally-oriented recesses, further comprising:

a fiber holder having a plurality of longitudinally-oriented v-groove in the undersurface thereof, each of said fibers being affixed in a respective one of said v-grooves, and said fiber holder being attached to said first submount with the undersurface of said fiber holder facing said first surface of said first submount, said fibers depending below the undersurface of said fiber holder and into said recesses in said first submount.

74. Apparatus according to claim 70, wherein said integrated optics chip has an overhang portion overhanging said first submount, further comprising:

a second submount having a second standoff structure protruding from a first surface thereof, said overhang portion of said integrated optics chip being attached to said second standoff structure such that said integrated optics chip contacts said second standoff structure in a third plurality of contact portions of said second standoff structure,

said optical fiber array being attached to said second submount.

75. Apparatus according to claim 74, wherein said second submount is spaced longitudinally from said first submount.

76. Apparatus according to claim 74, wherein said second submount includes longitudinally-oriented recesses, further comprising:

a fiber holder having a plurality of longitudinally-oriented v-groove in the undersurface thereof, each of said fibers being affixed in a respective one of said v-grooves, and said fiber holder being attached to said second submount with the

undersurface of said fiber holder facing said first surface of said second submount, said fibers depending below the undersurface of said fiber holder and into said recesses in said second submount.

77. Apparatus according to claim 70, further comprising an optical amplifier having an optical pump input connected to receive optical energy from one of said optical fibers.

78. Apparatus according to claim 70, further comprising a plurality of optical amplifiers each having an optical pump input connected to receive optical energy from a respective one of said optical fibers.

79. Apparatus according to claim 39, wherein said integrated optics chip has first and second optical outputs, both having a common plane of optical polarization, further comprising:

a polarization coupler having first and second polarization maintaining input fibers and an output fiber, said first input fiber being attached so as to receive optical energy from said first optical output, said first input fiber being attached with a first rotation relative to said output fiber, and said second input fiber being attached so as to receive optical energy from said second optical output, said second input fiber being attached with a second rotation 90° different from said first input fiber.

80. Optical apparatus comprising:

a submount having a standoff structure protruding from a first surface thereof;

an integrated optics chip bonded to said submount, said integrated optics chip having a first optical receiver and contacting said standoff structure in a first plurality of contact portions of said standoff structure, said first plurality of contact portions including all points on said standoff structure which contact said integrated optics chip, at least three consecutive ones of said contact portions along a straight line being mutually isolated from each other along said straight line; and

an optical emitter chip having a first optical emitter, said optical emitter chip being bonded to said submount in such a way that said first optical receiver can receive optical energy emitted by said first emitter.

81. A mounting method for optical components, comprising the steps of:

providing a submount having a standoff structure protruding from a first surface thereof;

juxtaposing an optical emitter chip against the standoff structure such that said emitter chip contacts said standoff structure in a first plurality of contact portions of said standoff structure, said first plurality of contact portions including all points on said standoff structure which contact said emitter chip after said step of juxtaposing, at least three consecutive ones of said contact portions along a straight line being mutually isolated from each other along said straight line;

bonding said emitter chip to said submount with a bonding agent which contacts said submount only in regions thereof other than on said first plurality of contact portions; and

juxtaposing an integrated optics chip against said standoff structure such that a first optical receiver of said integrated optics chip can receive optical energy emitted by said first emitter.

82. A method according to claim 81, wherein said step of bonding said emitter chip to said submount comprises the steps of:

applying an epoxy between two of said contact portions on said submount; and

after said step of juxtaposing, curing said epoxy.

83. A method according to claim 81, wherein said step of bonding said emitter chip to said submount comprises the steps of:

flowing solder between two of said contact portions on said submount; and

after said step of juxtaposing, cooling said solder.

84. A method according to claim 81, further comprising the step of forming solder bumps between said contact portions on said submount,

wherein said step of bonding said emitter chip to said submount is performed as part of said step of juxtaposing said emitter chip against said standoff structure.

85. A method according to claim 81, wherein said step of bonding said emitter chip to said first submount comprises the step of applying an electrically conductive bonding agent to an electrical trace disposed on said first submount between said contact portions, said bonding agent being in electrical contact with an electrical connection pad on said emitter chip after said step of bonding said emitter chip to said first submount.

86. A method according to claim 81, wherein said step of bonding said integrated optics chip to said first submount comprises the step of applying an electrically conductive bonding agent to an electrical trace disposed on said first submount between said contact portions, said bonding agent being in electrical

contact with an electrical connection pad on said integrated optics chip after said step of bonding said integrated optics chip to said first submount.

87. A method according to claim 81, wherein said emitter chip includes a plurality of optical ports arranged along a first edge of said emitter chip,

and wherein said straight line is a straight line parallel to said first edge of said emitter chip.

88. A method according to claim 87, wherein first and second consecutive mutually isolated contact portions along said straight line are spaced from each other by a first inter-standoff spacing,

and wherein said straight line is a straight line that is closer to said first edge than said first inter-standoff spacing.

89. A method according to claim 81, wherein said step of juxtaposing an integrated optics chip against said standoff structure comprises the step of juxtaposing said integrated optics chip against the standoff structure such that said integrated optics chip contacts said standoff structure in a second plurality of contact portions of said standoff structure, said second plurality of contact portions including all points on said standoff structure which contact said integrated optics chip after said step of juxtaposing said integrated optics chip against the standoff structure, at least three consecutive ones of said contact portions in said second plurality of contact portions along a given straight line being mutually isolated from each other along said given straight line

90. A method according to claim 89, further comprising the step of:

bonding said second optical component to said submount with a bonding agent which contacts said submount only in regions thereof other than on the contact portions in said second plurality of contact portions.

91. A method according to claim 90, wherein said standoff structure comprises a plurality of ribs arranged such that each rib includes a respective first segment which is in said first plurality of contact portions and a respective second segment which is in said second plurality of contact portions.

92. A method according to claim 81, further comprising the step of providing a first optical fiber disposed such that a receiving end of said first optical fiber can receive optical energy output from a first optical output of said integrated optics chip.

93. A method according to claim 92, further comprising the step of connecting an output end of said first optical fiber to provide pump optical energy to an optical amplifier.

94. A method according to claim 81, wherein said integrated optics chip comprises a mode converter in an optical path from said first optical receiver to a first optical output of said integrated optics chip.

95. A method according to claim 94, wherein said mode converter comprises a waveguide taper.

96. A method according to claim 81, wherein said integrated optics chip comprises:

a first waveguide segment in a first optical path from said first optical receiver to a first optical output of said integrated optics chip; and

a first wavelength stabilizer disposed in said first waveguide segment.

97. A method according to claim 96, wherein said wavelength stabilizer comprises a first feedback grating superimposed on said first waveguide segment.

98. A method according to claim 81, wherein said emitter chip further has a second optical emitter,

wherein said step of juxtaposing includes the step of juxtaposing said integrated optics chip against said standoff structure such that a second optical receiver of said integrated optics chip can receive optical energy emitted by said second emitter,

and wherein said integrated optics chip further comprises a directional coupler having a first input in a first optical path downstream of said first optical receiver, a second input in a second optical path downstream of said second optical receiver, and an output in an optical path upstream of said first optical output.

99. A method according to claim 81, wherein said integrated optics chip comprises a polarization rotator disposed in a first optical path from said first optical receiver to a first optical output of said integrated optics chip.

100. A method according to claim 81, wherein said integrated optics chip comprises a power monitor disposed to monitor optical power received by said first optical receiver.

101. A method according to claim 81, wherein said integrated optics chip comprises a controllable optical switch.

102. A method according to claim 81, wherein said integrated optics chip has a plurality of optical outputs, further comprising the step of attaching an optical fiber array having a plurality of optical fibers, such that receiving ends of each of said fibers can receive optical energy output from a respective one of the optical outputs of said integrated optics chip.

103. A method according to claim 102, wherein said step of attaching an optical fiber array comprises the step of attaching said optical fiber array to said first submount.

104. A method according to claim 103, further comprising the step of forming a plurality of longitudinally-oriented v-grooves in said first submount downstream of said integrated optics chip,

and wherein said step of attaching said optical fiber array to said first submount comprises the step of affixing each of said fibers in a respective one of said v-grooves.

105. A method according to claim 104, wherein said step of affixing occurs after said steps of bonding said emitter chip to said first submount and bonding said integrated optics chip to said first submount.

106. A method according to claim 103, wherein said first submount includes longitudinally-oriented recesses, and wherein said step of attaching said optical fiber array to said first submount comprises the steps of:

attaching each of said fibers in a longitudinally-oriented v-groove in the undersurface of a fiber holder; and

attaching said fiber holder to said first submount, said fibers depending below the undersurface of said fiber holder and into said recesses in said first submount.

107. A method according to claim 102, wherein said step of attaching an optical fiber array comprises the steps of:

providing a second submount having a second standoff structure protruding from a first surface thereof;

juxtaposing an overhang portion of said integrated optics chip overhanging said first submount against said second standoff structure such that said integrated optics chip contacts said second standoff structure in a third plurality of contact portions of said second standoff structure;

bonding said overhang portion of said integrated optics chip to said second submount; and

attaching said optical fiber array to said second submount.

108. A method according to claim 107, wherein said second submount is spaced longitudinally from said first submount.

109. A method according to claim 107, wherein said second submount includes longitudinal recesses, and wherein said step of attaching said optical fiber array to said second submount comprises the steps of:

attaching each of said fibers in a longitudinally-oriented v-groove in the undersurface of a fiber holder; and

attaching said fiber holder to said second submount, said fibers depending below the undersurface of said fiber holder and into said recesses in said second submount.

110. A method according to claim 102, further comprising the step of connecting an output end of one of said optical fibers to provide pump optical energy to an optical amplifier.

111. A method according to claim 102, further comprising the step of connecting the output end of each of said optical fibers to provide pump optical energy to a respective optical amplifier.

112. A method according to claim 81, wherein said integrated optics chip has first and second optical outputs, both having a common plane of optical polarization, further comprising the steps of:

providing a polarization coupler having first and second polarization maintaining input fibers and an output fiber;

attaching said first input fiber so as to receive optical energy from said first optical output, said first input fiber being attached with a first rotation relative to said output fiber; and

attaching said second input fiber so as to receive optical energy from said second optical output, said second input fiber being attached with a second rotation 90° different from said first input fiber.

113. A product produced using the method of any of claims 81, 83, 90, 102 and 111.

114. A mounting method for optical components, comprising the steps of:

providing a submount having a standoff structure protruding from a first surface thereof;

juxtaposing an integrated optics chip against the standoff structure such that said integrated optics chip contacts said standoff structure in a first plurality of contact portions of said standoff structure, said first plurality of contact portions including all points on said standoff structure which contact said integrated optics chip after said step of juxtaposing, at least three consecutive ones of said contact portions along a straight line being mutually isolated from each other along said straight line;

bonding said integrated optics chip to said submount with a bonding agent which contacts submount only in regions thereof other than on said first plurality of contact portions; and

juxtaposing an optical emitter chip against said standoff structure such that a first optical receiver of said integrated optics chip can receive optical energy emitted by said first emitter.

115. A method for making an optical assembly, comprising the steps of:

providing a first submount having a standoff structure protruding from a first surface thereof;

pressing an optical array emitter chip against the standoff structure such that at least said emitter chip deforms and said emitter chip contacts said standoff structure in a first plurality of contact portions of said standoff structure, said emitter chip having a plurality of optical emitters;

bonding said emitter chip to said first submount;

juxtaposing against said standoff structure an optical fiber array having a plurality of optical fibers, such that a receiving end of each of said fibers can receive optical energy emitted by a respective one of said optical emitters, and

bonding said integrated optics chip to said first submount.

116. A method according to claim 115, wherein said optical emitters are disposed on a subject edge of said emitter chip,

and wherein said standoff structure comprises a plurality of at least three segments which are mutually isolated from each other at least under said subject edge of said emitter chip, and which are arranged such that each segment includes a respective first portion which contacts said emitter chip and a respective second portion which contacts said optical fiber array.

117. A method according to claim 115, wherein said step of bonding said emitter chip to said first submount comprises the step of applying an electrically conductive bonding agent to an electrical trace disposed on said first submount between said contact portions, said bonding agent being in electrical contact with an electrical connection pad on said emitter chip after said step of bonding said emitter chip to said first submount.

118. A method according to claim 115, wherein said first plurality of contact portions includes all points on said standoff structure which contact said emitter chip after said step of pressing,

wherein said plurality of optical emitters are arranged along a first edge of said emitter chip,

and wherein at least three consecutive ones of said contact portions along said first edge of said emitter chip are mutually isolated from each other along said first edge.

119. A method according to claim 115, further comprising the step of pressing said optical fiber array against said standoff structure after said step of juxtaposing, such that at least said optical fiber array deforms and said optical fiber array contacts said standoff structure in a second plurality of contact portions of said standoff structure.

120. A method according to claim 115, wherein said step of juxtaposing includes the steps of:

activating a first one of said optical emitters to emit optical energy and monitoring optical energy captured by one of said optical fibers; and

repositioning said optical fiber array laterally relative to said first submount in response to said step of monitoring.

121. A method according to claim 120, wherein said step of juxtaposing further includes the step of activating a second one of said optical emitters to emit optical energy and monitoring optical energy captured by a second one of said optical fibers,

and wherein said step of repositioning is performed further in response to said step of monitoring optical energy captured by a second one of said optical fibers.

122. A method according to claim 115, wherein said emitter chip includes first and second opposite major surfaces, and wherein said step of pressing comprises the steps of:

affixing said first surface of said emitter chip to a compliant surface of a chuck;

moving said chuck such that said second surface of said optical component contacts said standoff structure; and

pressing said chuck toward said first submount until said emitter chip deforms to contact said standoff structure in said first plurality of contact portions.

123. A method according to claim 115, wherein said first submount includes longitudinally-oriented recesses, and wherein said steps of juxtaposing and bonding said integrated optics chip to said first submount collectively comprise the steps of:

attaching each of said fibers in a longitudinally-oriented v-groove in the undersurface of a fiber holder; and

attaching said fiber holder to said first submount, said fibers depending below the undersurface of said fiber holder and into said recesses in said first submount.

124. A method according to claim 115, further comprising the step of connecting an output end of one of said optical fibers to provide pump optical energy to an optical amplifier.

125. A method according to claim 115, further comprising the step of connecting the output end of each of said optical fibers to provide pump optical energy to a respective optical amplifier.

126. A product produced using the method of any of claims 115, 124 and 125.

127. Optical apparatus comprising:

a first submount having a standoff structure protruding from a first surface thereof;

an optical array emitter chip bonded to said first submount, said optical emitter chip having a plurality of optical emitters and contacting said standoff structure in a first plurality of contact portions of said standoff structure, said first plurality of contact portions including all points on said standoff structure which contact said emitter chip, at least three consecutive ones of said contact portions along a straight line being mutually isolated from each other along said straight line; and

an optical fiber array having a plurality of optical fibers, said optical fiber array being bonded to said first submount in such a way that said a receiving end of each of said fibers can receive optical energy emitted by a respective one of said optical emitters.

128. Apparatus according to claim 127, wherein said optical fiber array contacts said standoff structure in a second plurality of contact portions of said standoff structure, said second plurality of contact portions including all points on said standoff structure which contact said optical fiber array, at least three consecutive ones of said contact portions in said second plurality of contact portions along a given straight line being mutually isolated from each other along said given straight line.

129. Apparatus according to claim 127, further comprising:

an electrical trace disposed on said first submount between said contact portions;

and an electrical connection pad on said emitter chip; and

an electrically conductive material bonding said emitter chip to said first submount and making electrical contact with both said electrical trace on said first submount and said electrical connection pad on said emitter chip.

130. Apparatus according to claim 127, wherein said optical emitters are arranged along a first edge of said emitter chip,

and wherein at least three consecutive ones of said contact portions along a straight line parallel to said first edge of said emitter chip are mutually isolated from each other along said straight line parallel to said first edge.

131. Apparatus according to claim 127, wherein said standoff structure comprises a plurality of ribs arranged such that each rib includes a respective first segment which is in said first plurality of contact portions and a respective second segment which extends under said optical fiber array.

132. Apparatus according to claim 127, wherein said first submount includes longitudinally-oriented recesses,

wherein said optical fiber array comprises a fiber holder having a plurality of longitudinally-oriented v-groove in the undersurface thereof, each of said fibers being affixed in a respective one of said v-grooves, and

and wherein said fiber holder is attached to said first submount with the undersurface of said fiber holder facing said first surface of said first submount,

said fibers depending below the undersurface of said fiber holder and into said recesses in said first submount.

133. Apparatus according to claim 127, further comprising an optical amplifier having an optical pump input connected to receive optical energy from one of said optical fibers.

134. Apparatus according to claim 127, further comprising a plurality of optical amplifiers each having an optical pump input connected to receive optical energy from a respective one of said optical fibers.

135. Optical apparatus comprising:

a submount having a standoff structure protruding from a first surface thereof;

an integrated optics chip bonded to said submount, said integrated optics chip having a first optical receiver and contacting said standoff structure in a first plurality of contact portions of said standoff structure, said first plurality of contact portions including all points on said standoff structure which contact said integrated optics chip, at least three consecutive ones of said contact portions along a straight line being mutually isolated from each other along said straight line; and

an optical emitter chip having a first optical emitter, said optical emitter chip being bonded to said submount in such a way that said first optical receiver can receive optical energy emitted by said first emitter.

136. A mounting method for optical components, comprising the steps of:

providing a submount having a standoff structure protruding from a first surface thereof;

juxtaposing an optical array emitter chip against the standoff structure such that said emitter chip contacts said standoff structure in a first plurality of contact portions of said standoff structure, said first plurality of contact portions including all points on said standoff structure which contact said emitter chip after said step of juxtaposing, at least three consecutive ones of said contact portions along a straight line being mutually isolated from each other along said straight line;

bonding said emitter chip to said submount with a bonding agent which contacts said submount only in regions thereof other than on said first plurality of contact portions; and

juxtaposing against said standoff structure an optical fiber array having a plurality of optical fibers, said optical fiber array being arranged such that receiving ends of each of said fibers can receive optical energy emitted by a respective optical emitter on said optical array emitter chip.

137. A method according to claim 136, wherein said step of bonding said emitter chip to said first submount comprises the step of applying an electrically conductive material to an electrical trace disposed on said first submount between said contact portions, said material being in electrical contact with an electrical connection pad on said emitter chip after said step of bonding said emitter chip to said first submount.

138. A method according to claim 136, wherein said optical emitters on said emitter chip are arranged along a first edge of said emitter chip,

and wherein said straight line is a straight line parallel to said first edge of said emitter chip.

139. A method according to claim 138, wherein first and second consecutive mutually isolated contact portions along said straight line are spaced from each other by a first inter-standoff spacing,

and wherein said straight line is a straight line that is closer to said first edge than said first inter-standoff spacing.

140. A method according to claim 136, wherein said step of juxtaposing an optical fiber array against said standoff structure comprises the step of juxtaposing said optical fiber array against the standoff structure such that said optical fiber array contacts said standoff structure in a second plurality of contact portions of said standoff structure, said second plurality of contact portions including all points on said standoff structure which contact said optical fiber array after said step of juxtaposing said optical fiber array against the standoff structure, at least three consecutive ones of said contact portions in said second plurality of contact portions along a given straight line being mutually isolated from each other along said given straight line.

141. A method according to claim 140, further comprising the step of:

bonding said optical fiber array to said submount with a bonding agent which contacts said submount only in regions thereof other than on the contact portions in said second plurality of contact portions.

142. A method according to claim 141, wherein said standoff structure comprises a plurality of ribs arranged such that each rib includes a respective first segment which is in said first plurality of contact portions and a respective second segment which is in said second plurality of contact portions.

143. A method according to claim 136, wherein said first submount includes longitudinally-oriented recesses, and wherein said step of juxtaposing an optical fiber array against said standoff structure comprises the steps of:

attaching each of said fibers in a longitudinally-oriented v-groove in the undersurface of a fiber holder; and

attaching said fiber holder to said first submount, said fibers depending below the undersurface of said fiber holder and into said recesses in said first submount.

144. A method according to claim 136, further comprising the step of connecting the output end of each of said optical fibers to provide pump optical energy to a respective optical amplifier.

145. A product produced using the method of either of claims 136 and 144.

146. A mounting method for optical components, comprising the steps of:

providing a submount having a standoff structure protruding from a first surface thereof;

juxtaposing against the standoff structure an optical fiber array having a plurality of optical fibers, such that said optical fiber array contacts said standoff structure in a first plurality of contact portions of said standoff structure, said first plurality of contact portions including all points on said standoff structure which contact said optical fiber array after said step of juxtaposing, at least three consecutive ones of said contact portions along a straight line being mutually isolated from each other along said straight line;

bonding said optical fiber array to said submount with a bonding agent which contacts said submount only in regions thereof other than on said first plurality of contact portions; and

juxtaposing an optical array emitter chip against said standoff structure such that receiving ends of each of said fibers can receive optical energy emitted by a respective optical emitter on said optical array emitter chip.